भारतीय मानक
Indian Standard

IS 5557 (Part 2) : 2018

पूरे रबर के गम जूते एवं ऐंकल जूते

भाग 2 व्यवसाय हेतु

All Rubber Gum Boots and Ankle Boots

Part 2 Occupational Purposes

ICS 61.060

© BIS 2018

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली-110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.org.in www.standardsbis.in

October 2018 **Price Group 4**

Footwear Sectional Committee, CHD 19

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards after the draft finalized by the Footwear Sectional Committee had been approved by the Chemical Division Council.

All rubber boots with lining or without lining when produced in conventional assembly and vulcanized, are used to protect feet, ankle and knee against rain / wet conditions and also when used in slurry areas. Rubber knee boots are also known popularly as gum boots. The upper portion of gum boots extends almost to knee height and its sole is designed to prevent slipping.

Such boots are recommended for use in tanneries, food and beverage industries, sewage treatment plant, petrochemical industries, pharmaceutical industries, garbage disposal and related municipal operations, cement and construction work, road building, etc. Such boots are having wide ranging operation including horticulture and agriculture in cold bound areas also. There are even special uses of these boots in petrol pumps and other uses in oily areas where the boots are needed to be oil-resistant.

This standard has been prepared as an alternative to withdrawn standard IS 3738 : 2004 "Rubber boots — Specification" with updated specifications as per the latest technological advancements in this field. This standard will constitute Part 2 and it will cover the specifications for occupational rubber boots. Part 1 of IS 5557, will cover the specifications for safety and protective rubber boots.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

ALL RUBBER GUM BOOTS AND ANKLE BOOTS

PART 2 OCCUPATIONAL PURPOSES

1 SCOPE

This standard prescribes requirements, methods of sampling, and tests for rubber boots to be used by workers in wet and slurry conditions or in conditions where the workers are exposed to chemicals, oil and grease.

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

For the purpose of this standard, definitions given in IS 2050 and the following shall apply:

3.1 Classification — All rubber footwear falls into the category of Class II vide **4** of IS 15298 (Part 4).

3.2 Compact Insocks — Compact insocks are made of suitable rubber/elastomer/polymer having density not less than 0.9 g/cm^3, coated with textile.

3.3 Compact Insole — Compact insoles are made of suitable rubber/elastomer/polymer having density not less than 0.9 g/cm^3, coated with textile.

3.4 Compact Outsole/Heel — For compact outsole/heel, rubber/elastomer/polymer having density not less than 0.9 g/cm^3 shall be used.

3.5 Lining — Material covering the inner surface of the upper. Vamp lining is material covering the inner surface of the forepart of upper. Quarter lining is material covering the inner surface of the quarter of upper.

NOTE — Above is having reference to IS 15298 (Part 4) vide **3.7, 3.7.1** and **3.7.2**.

3.6 Occupational Footwear — Footwear incorporating features suitable for operation in wet condition related working areas, including slushy condition, and greasy areas for protection of feet. These footwear are not equipped with steel or fibre toe cap.

3.7 Rubber — Rubber is defined in **3.3** of IS 15298 (Part 4) and can also be defined under Harmonized System of Nomenclature (HSN) as goods to fall under chapter head of 40.

4 TYPE AND VARIETY

This standards covers the following two types based on design:

a) *Type* 1 — Ankle boots, and
b) *Type* 2 — Wellington/Gum boots.

This standard covers the following three varieties based on purpose:

a) *Variety* 1 — for use in areas having contact with oil and grease,
b) *Variety* 2 — for use in fire and explosive prone area, and
c) *Variety* 3 — for use in general working conditions.

5 DESIGN

The boots of Type 1 and Type 2 are recommended to have typical designs as shown in Fig. 1 and Fig. 2.

6 SIZES AND FITTINGS

Fittings of footwear shall be in conformity to Table 8 and Table 9 of IS 1638 for women's and men's lasts, respectively.

7 MATERIALS AND PROPERTIES

7.1 Lining Material

Textile lining material shall be used.

7.1.1 *Tear Strength*

When the lining is tested in accordance with **6.3** of IS 15298 (Part 1), it shall satisfy the requirements prescribed in **5.5.1** of IS 15298 (Part 4) vide Table 13.

7.1.2 *Abrasion Resistance*

When tested in accordance with **6.12** of IS 15298 (Part 1), the lining shall not develop any holes before 25 600 cycles in dry condition and 12 800 cycles in wet condition.

7.2 Coated Binding Material

Coated binding materials shall conform to requirements prescribed in Table 1 when tested according to methods prescribed in col 4 of Table 1.

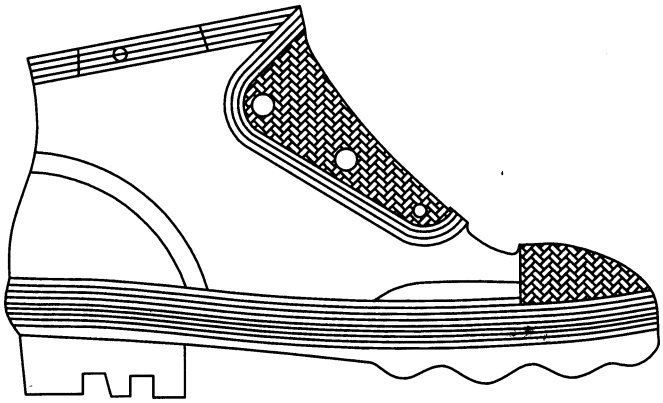

FIG.1 ANKLE BOOTS, TYPE 1

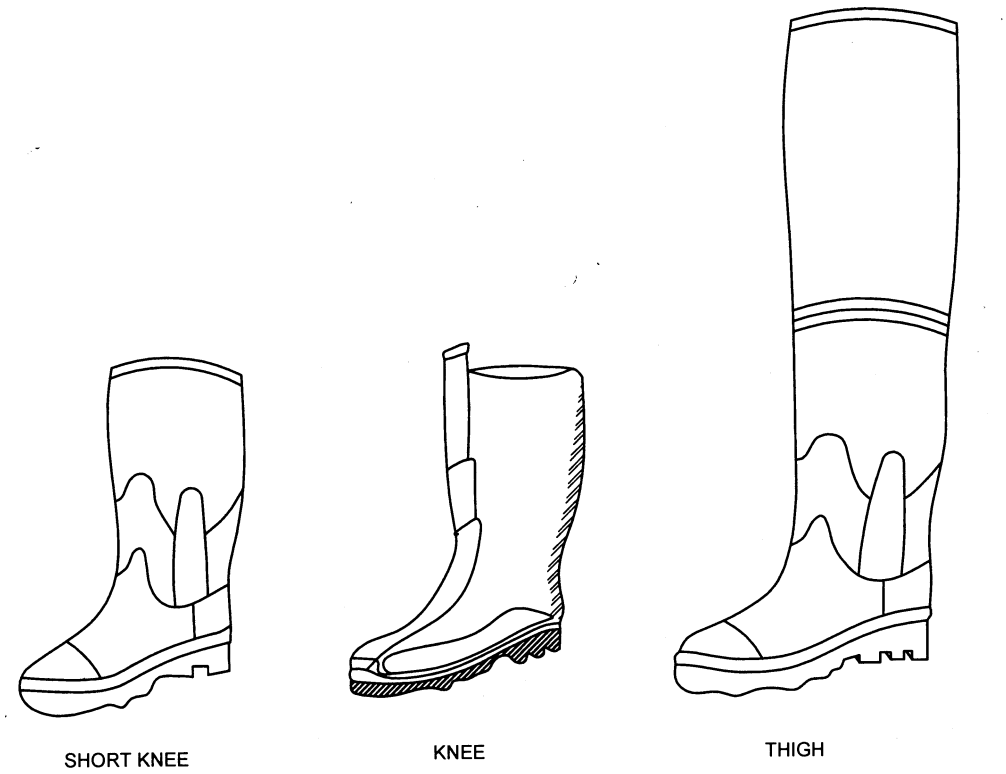

FIG. 2 GUM BOOTS, TYPE 2

Table 1 Requirements of Coated Binding Material
(*Clause* 7.2)

Sl No.	Characteristics	Requirements	Methods of Test, Ref to
(1)	(2)	(3)	(4)
i)	Width in mm, *Min*	13	1954
ii)	Breaking load in N, *Min* (50 cm grip length test specimen)	360	Annex B

7.3 Thread for Upper Closing

The breaking load and construction of the sewing thread used for upper closing shall be conforming to requirements as prescribed in Table 2. Colour of thread will be as agreed to between the manufacturer and the purchaser. In case of black cotton thread, the same shall be free from sulphur dyes when tested in accordance with Annex C.

7.4 Use of Rubber

Bi-density/bi-elastomer or rubber with polymer/ elastomer insert.

7.4.1 *Physical Requirements of Rubber Components*

All components shall conform to Table 3 when tested according to prescribed test methods given in col 5 of Table 3.

Table 2 Requirement of Sewing Thread
(*Clause* 7.3)

Sl No.	Components	Material	Method of Test, Ref to IS
(1)	(2)	(3)	(4)
i)	Sewing thread for piping / binding	Sewing polyester thread variety No. 5 (145 dtex ×3) OR Any other thread as agreed to between the purchaser and the manufacturer, but breaking strength not less than as specified in **4.1** of IS 9543.	9543

Table 3 Physical Requirements of Rubber Components
(*Clause* 7.4.1)

Sl No.	Characteristics	Body	Outer Sole Heel	Method of Test, Ref to IS
(1)	(2)	(3)	(4)	(5)
i)	Hardness (IRHD)	50 ± 5	60 ± 5	3400 (Part 2)
ii)	Change in hardness after accelerated ageing at 100 ± 2 ºC for 24 h	+5 -2	+5 -2	3400 (Part 4)

7.5 Upper

Upper shall be made of rubber duly injected or casted or compressed over a lining material.

However, upper for conventional assembly and vulcanized are to be made from single texture rubberized textile fabric (HSN Chapter 59) and such uppers are unlined.

7.5.1 *Tensile Strength*

When tested in accordance with **6.4.2** of IS 15298 (Part 1), the rubber upper shall meet the requirement given in **5.4.4** vide Table 11 in IS 15298 (Part 4).

7.5.2 *Thickness*

The rubber upper shall meet the requirement prescribed in **5.4.2** vide Table 9 in IS 15298 (Part 4) when tested in accordance with **6.1** of IS 15298 (Part 1).

7.5.3 *Flexing Resistance*

When tested in accordance with **6.5.2** of IS 15298 (Part 1), the rubber upper shall satisfy the requirements prescribed in **5.4.5** vide Table 12 in IS 15298 (Part 4).

7.6 Outsole/Heel

Outsole/Heel shall be made of rubber/elastomeric material or with polymeric insert in rubber, by process of injection or casting (process of latex) or compression moulding or rolled sole.

7.6.1 *Thickness*

Thickness of outsole/heel shall be as under:

a) *Outsole Forepart*
With cleat — 10 mm, *Min*
Without cleat — 6 mm, *Min*

b) *Heel*
With cleat — 15 mm, *Min*
Without cleat — 9 mm, *Min*

NOTE — When Variety 1 and Variety 2 boots are produced, the outsole heel shall be compact in nature.

7.6.2 *Tear Strength*

When tested according to **8.2** of IS 15298 (Part 1), the tear strength of outsole of Variety 1 and Variety 2 boots shall not be less than 8 kN/m, and for variety 3 boots, the tear strength shall not be less htan 5 kN/m.

7.6.3 *Abrasion Resistance*

When outsole/heel is tested in accordance with **8.3** of IS 15298 (Part 1), the relative volume loss shall not be greater than 250 mm^3.

7.6.4 *Flexing Resistance*

When outsole/heel is tested in accordance with **8.4** of IS 15298 (Part 1), the outsole shall meet requirements prescribed in **5.8.4** of IS 15298 (Part 4).

7.6.5 *Interlayer Bond Strength*

When outsole/heel is tested in accordance with **5.2** of IS 15298 (Part 1), the bond strength between the outer or cleated layer and the adjacent layer shall not be less than 4.0 N/mm unless there is tear at any point of the outsole, in which case the bond strength shall not be less than 3.0 N/mm.

7.7 Insocks

Rubber/Elastomers/Polymeric material with lining.

For Variety 1 and Variety 2 boots, compact insocks shall be used.

7.7.1 *Thickness*

Insocks shall have minimum thickness of 2.0 mm.

7.7.2 *Abrasion Resistance*

When insocks are tested in accordance to **6.12** of IS 15298 (Part 1), the wearing surface shall not develop any holes before 25 600 cycles in dry condition and 12 800 cycles in wet condition.

8 CONSTRUCTION

The footwear shall be manufactured by injection/ casting/compression and conventional assembly, as suitable through the process of vulcanization of rubber and can be with or without lining.

The footwear manufactured in conventional assembly from single texture rubberized fabric and vulcanized, is an unlined footwear.

The edges of the upper and tongue may be binded with coated binding material with thread meeting requirements as given in Table No. 2. Type 1 and Type 2 boots may be attached with additional fittings as agreed to between the manufacturer and the purchaser.

Two pairs of insocks shall be provided.

8.1 Resistance to Hot Contact — Outsole/Heel and Upper

For Variety 1 and Variety 2 boots, the outsole/heel and upper shall not melt/deform or become sticky and shall not develop any crack when bent around the mandrel, when tested in accordance with **8.7** of IS 15298 (Part 1).

8.2 Leak Proof Test

When the whole footwear is tested in accordance with **5.7** of IS 15298 (Part 1), there shall not be any leakage of air.

8.3 Height of Upper

The boots shall conform to design B, C, D, or E given in Fig. 3 in IS 15298 (Part 4) and the height of upper, when tested in accordance with **6.2** of IS 15298 (Part 1), shall conform to requirements prescribed in **5.2.2** of IS 15298 (Part 4).

8.4 Adhesion Test for Rubberized Textile Upper

Representative samples of width 25 ± 5 mm are cut out from the whole footwear along the length of the boot. The rubber and fabric plies are separated by breaking the bond.

Test on 2 specimens are carried out in accordance with IS 3400 (Part 5). There shall be no separation at a load of 1.5 kg.

8.5 Resistance to Acid and Alkali

For boots of Varieties 1, 2 and 3, if resistance to acid and alkali is required, the whole footwear material shall comply with requirements prescribed in **4.3.10** in IS 5915.

8.6 Resistance to Fuel Oil

For boots of Varieties 1, 2 and 3, if resistance to fuel oil is required, whole footwear shall comply with requirements prescribed in **6.4.2** of IS 15298 (Part 4), when tested according to **8.6** of IS 15298 (Part 1).

8.7 Additional Requirements for Special Applications

Against indent of purchaser, manufacturer may provide additional features as mentioned below to meet working conditions.

8.7.1 *Antistatic Footwear*

The boots shall comply with **6.2.2.2** of IS 15298 (Part 4) when tested in accordance with **5.10** of IS 15298 (Part 1).

8.7.2 *Conductive Footwear*

The boots shall comply with **6.2.2.1** of IS 15298 (Part 4) when tested in accordance with **5.10** of IS 15298 (Part 1).

8.7.3 *Electrically Insulating Footwear*

The boots shall comply with **6.2.2.3** of IS 15298 (Part 4).

8.7.4 *Resistance to Cold*

The boots shall comply with **6.2.3.2** of IS 15298 (Part 4) when tested in accordance with **5.13** of IS 15298 (Part 1).

9 LIST OF BANNED CHEMICALS

The chemicals listed in Tables 4, 5, and 6 are banned from use for production of footwear.

9.1 List of Allergenic Disperse Dyes

The presence of allergenic disperse dyes present in textile used in the footwear can be tested in accordance with tests provided in IS 16914(Part 2) (*see* Table 4).

9.2 List of Carcinogenic Disperse Dyes

The presence of carcinogenic disperse dyes present in textile used in the footwear can be tested in accordance with tests provided in IS 16914(Part 2) and IS 16914(Part 3) (*see* Table 5).

Table 4 List of Allergenic Disperse Dyes
(*Clause* 9.1)

Sl No.	Disperse Dye	CAS No.
(1)	(2)	(3)
i)	Disperse blue 1	2475-458
ii)	Disperse blue 3	2475-46-9
iii)	Disperse blue 7	3179-90-6
iv)	Disperse blue 26	3860-63-7
v)	Disperse blue 35	56524-77-7 & 56524-76-6
vi)	Disperse blue 102	12222-97-8
vii)	Disperse blue 106	12223-01-7
viii)	Disperse blue 124	61951-51-7
ix)	Disperse yellow 1	119-15-3
x)	Disperse yellow 3	2832-40-8
xi)	Disperse yellow 9	6373-73-5
xii)	Disperse yellow 23	6250-23-3
xiii)	Disperse yellow 39	12236-29-2
xiv)	Disperse yellow 49	54824-37-2
xv)	Disperse Orange 1	2581-69-3
xvi)	Disperse Orange 3	730-40-5
xvii)	Disperse Orange 11	82-28-0
xviii)	Disperse Orange 37/76	12223-33-5
xix)	Disperse Orange 149	85136-74-9
xx)	Disperse red 1	2872-52-8
xxi)	Disperse red 11	2872-48-2
xxii)	Disperse red 17	3179-89-3
xxiii)	Disperse brown 1	23355-64-8

Table 5 List of Carcinogenic Disperse Dyes
(*Clause* 9.2)

Sl No.	Disperse Dye	CAS No.
(1)	(2)	(3)
i)	Acid Red 26	3761-53-3
ii)	Basic red 9	569-61-9
iii)	Direct Black 38	1937-37-7
iv)	Direct Blue 6	2602-46-2
v)	Direct Red 28	573-58-0
vi)	Dispersed Blue 1	2475-45-8
vii)	Dispersed yellow 3	2832-40-8
viii)	Basic voilet 14	632-99-5
ix)	Disperse orange 11	82-28-0

9.3 List of Phthalates

The presence of phthalate in all types of footwear material can be tested in accordance with IS 16915 (*see* Table 6).

Table 6 List of Phthalates
(*Clause* 9.3)

Sl No.	Phthalate
(1)	(2)
i)	Butyl Benzyl Phthalate (BBP)
ii)	Bis(2-ethyl hexyl)Phthalate) (DEHP)
iii)	Dibutyl Phthalate (DBP)
iv)	Diisobutyl Phthalate (DIBP)
v)	1,2-Benzene dicarboxlic acid,di-C7-11 Branched and linear alkyl esters (DHNUP)
vi)	1,22-benzenedicarboxylic acid, di –C6-8-branched alkyl esters C7-rich (DIHP)
vii)	Di-Isononyl Phthalate (DINP)
viii)	Di-*n*-Octyl Phthalate (DNOP)
ix)	Di-Isodecyl Phthalate (DIDP)
x)	Di-(2-methoxyethyl)-phthalate (DMEP)
xi)	Di-*n*-hexyl phthalate (DnHP)

10 FINISH OF BOOTS

In appearance, general workmanship and in all other aspects with regard to finish of boots, they shall match the approved sample of the purchaser.

11 MARKING

11.1 Each boot shall be permanently marked with the following:

a) Size,
b) Manufacturer's name and brand,
c) Year and month of manufacture,
d) Number and year of the standard, based upon which the boots are produced,
e) Classification — Safety or protective or occupational
f) Any other statutory marking

11.2 BIS Certification Marking

The shoes may also be marked with the Standard Mark.

11.3 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

All markings shall be made inside of tongue or at top outer face of the boot so that least damage is done during working.

12 INFORMATION TO BE SUPPLIED

Each pair of boot shall be supplied with the following information in Hindi and English:

a) Name and full address of manufacturer,
b) Details of customer care service provider,
c) Instruction for storage and maintenance,
d) Drying procedure for wet boots and proper cleaning of boots,
e) Time period for obsolescence,
f) Wherever applicable, declaration to be made stating footwear is not for use in fire hazard/ explosion prone areas and in hot contact areas,
g) The footwear is not a GREEN footwear and not bio-degradable.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
1638 : 1969	Sizes and fitting of footwear
1954 : 1990	Determination of length and width of woven fabrics — Methods
2050 : 1991	Glossary of terms relating to footwear
3400 (Part 2) : 2014	Methods of test for vulcanized rubber: Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)
(Part 4) : 2012	Accelerated ageing and heat resistance (*first revision*)
(Part 5) : 1986	Adhesion of rubbers to textile fabrics (*second revision*)
5915 : 1970	Single texture rubberized waterproof fabrics
9543 : 2015	Textiles — Spun polyester sewing threads — Specification (*first revision*)
15298 (Part 1) : 2015	Personal protective equipment Test methods for footwear (*second revision*)
15298 (Part 4) : 2010	Occuptional footwear
16914 (Part 2) : 2018	Textiles used in footwear : Textile dyestuffs : Part 2 General method for the determination of extractable dyestuffs including allergenic and carcinogenic dyestuffs (method using pyrindine — Water)
16914 (Part 3) : 2018	Textiles used in footwear - Textile dyestuffs : Part 3 Method of determination of certain carcinogenic dyestuffs (method using triethylamine/methanol)
16915 : 2018	Footwear — Critical substances potentially present in footwear and footwear components — Determination of phthalates in footwear materials

ANNEX B

[*Clause* 7.2 and *Table* 1 Sl No.(iii)]

METHOD FOR DETERMINATION OF BREAKING LOAD AND ELONGATION AT BREAK

Breaking force and extension at break of the coated binding material can be tested in the dry state and in the wet state. The material is extended until it breaks using a tensile testing machine shown in Fig. 3.

B-1 PROCEDURE

Prepare three coated binding material specimens of length sufficient to enable satisfactory clamping in the jaws while leaving a test length of 500 mm between them. After conditioning, extend each specimen by tensile testing with the machine whose jaws separate at a rate of 100 mm/min until the test sample breaks. Record the maximum force obtained in Newton, and the extension at break if required. The arithmetic mean of three results is reported. If the test sample is constructed from several component parts, such as a case and a core, carefully watch the test specimen as it is extended and record the force when each of these component parts break.

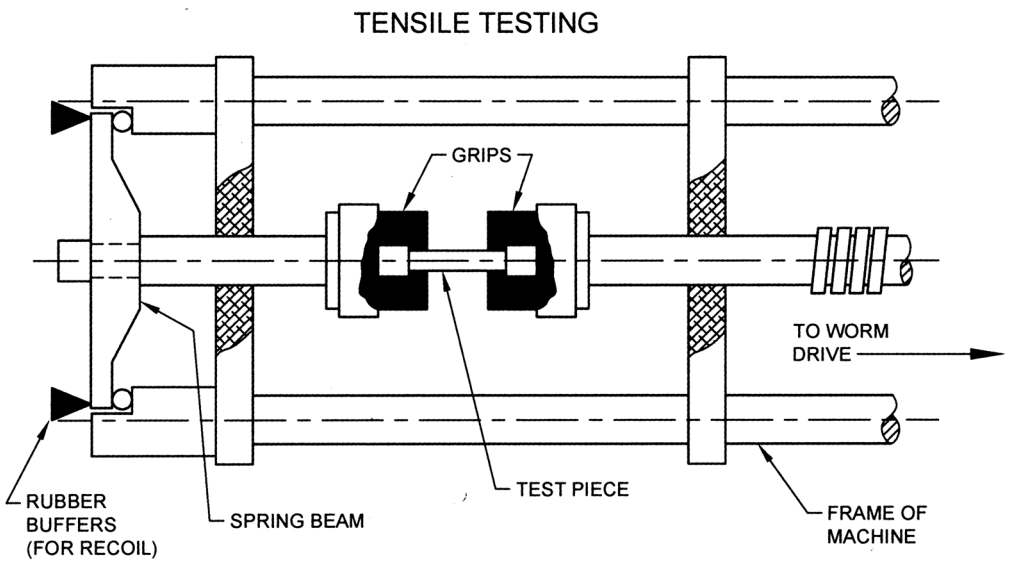

FIG. 3 MACHINE FOR TENSILE TEST WITH GRIPS AND SAMPLE IN-BETWEEN

ANNEX C

(*Clause* 7.3)

METHODS FOR DETECTION OF SULPHUR DYES IN BLACK COLOURED LACES NEWAR (TAPE), THREAD AND FABRIC

C-1 PROCEDURE

C-1.1 Boil the laces in alkaline hydrosulphite solution for 1 min. If the shade is reduced to pale brown or yellow colour and on oxidation restored to the original colour, Sulphur dyes shall be suspected to be present.

C-1.2 For confirmation, boil the laces in acid stannous chloride solution in a test tube covered with a piece of filter paper moistened with lead acetate. A blackish/ brown stain with metallic luster confirms the presence of sulphur dyes.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc No.: CHD 19 (11322).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.org.in

Regional Offices: *Telephones*

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002 — 2323 7617, 2323 3841

Eastern : 1/14 C.I.T. Scheme VII M, V. I. P. Road, Kankurgachi, KOLKATA 700054 — 2337 8499, 2337 8561, 2337 8626, 2337 9120

Northern : Plot No. 4-A, Sector 27-B, Madhya Marg, CHANDIGARH 160019 — 26 50206, 265 0290

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113 — 2254 1216, 2254 1442, 2254 2519, 2254 2315

Western : Manakalaya, E9 MIDC, Marol, Andheri (East), MUMBAI 400093 — 2832 9295, 2832 7858, 2832 7891, 2832 7892

Branches: AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. COIMBATORE. DEHRADUN. DURGAPUR. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. JAMMU. JAMSHEDPUR. KOCHI. LUCKNOW. NAGPUR. PARWANOO. PATNA. PUNE. RAIPUR. RAJKOT. VISAKHAPATNAM.

Published by BIS, New Delhi